

## Grand Canyon National Park's Ranger Audio Tour **Geology at Bright Angel Point**

Welcome to Bright Angel Point, from here you can capture the essence of Grand Canyon geology. The Grand Canyon is extensive--approximately 277 miles long, incredibly deep--over one mile, and here the north and south rim are approximately 10 miles apart. As you gaze out into the Grand Canyon you are looking at one of nature's geological wonders. Here you can see what a symphony of stone, time, and water can compose.

One of the first key components that make the Grand Canyon grand starts with depositing of sediment. Each and every layer in the canyon represents a type of depositional environment that once existed in the region. There are three types of rock found in the world; sedimentary, metamorphic, and igneous--and all three types are below your feet. Each rock layer tells a story that starts with the older igneous and metamorphic rocks on the bottom and the more colorful sedimentary rock layers stacked on top.

As you glance down into the inner canyon you are looking at the Precambrian Schist formation; geologists date this formation to around 1700 million years old. During this time Arizona actually had ocean front property, since the North American Plate was colliding with a chain of volcanic islands that created a mountain range. The mountains would ultimately erode away leaving only the basement rocks, which you see today. As you peer down at these rocks you are looking at almost half of the Earth's history.

As your eyes travel up the South Rim, notice the red sheer cliff rock layer--this 500-foot cliff layer is prominent throughout the canyon due to its red-stained face. Around 340 million years ago marine waters covered large portions of the North American continent. The Redwall Limestone would be deposited in this shallow sea environment. The red you see is not the limestone's true color. Over time the soft shale sloped layer above, which is enriched with iron, has leached upon the grayish limestone creating the famous Redwall.

High above the Redwall is the prominent white cliff called the Coconino Sandstone. The ocean receded 270 million years ago, leaving behind a harsh desert climate similar to the Sahara Desert. This white cliff is perhaps the most evident layer throughout the Grand Canyon.

The ocean would eventually rise again covering the edge of the continent creating a new limestone layer called the Kaibab, coined from the Paiute Band term meaning "mountain lying down." This would be the layer your feet are now resting on. On your hike back, look around to see if you spot any of the ancient sea life fossils which were past residents of the Grand Canyon area.

At this time you would be viewing an ocean rather than a canyon, since the rocks were at sea level, unlike today. Over 30 million years, these rocks would be pushed more than a mile up, exposing them to powerful forces of erosion. This gentle uplift was caused by the collision of tectonic plates, since continents have been migrating across the earth's surface for billions of years. Millions of years later the North Rim would be tilted an additional

1600 feet higher than the South Rim. Long after uplift, the snow-fed Colorado River would finally find its way to the sea, carving its way through soft sedimentary rock. The river now flows across the crystalline core of the continent. While the river carved the canyon, the semi-arid climate makes it possible for rock to be preserved, as well as seen. The Grand Canyon is one of many geological paradises in the world. It just so happens that this canyon allows us to gaze through its window of time.